Patent Claims

1.   A method for the spatially resolved polarimetric examination of an imaging beam pencil (1) generated by an associated radiation source (9), having the following steps:

- introduction of a first photoelastic modulator (6a), a second photoelastic modulator (6b) and a polarization element (5) serially into the beam pencil (1),
- activation of a first modulation oscillation of the first photoelastic modulator and a second modulation oscillation of the second photoelastic modulator,
- use of a pulsed radiation source (9) for generation of the beam pencil and driving of the radiation source for outputting a respective radiation pulse in a manner dependent on the oscillation state of the first photoelastic modulator and/or the second photoelastic modulator, and
- spatially resolved detection of the beam pencil coming from the polarization element (5).

2.   The method as claimed in claim 1, wherein the first and second modulation oscillations are activated with different oscillation frequencies and a plurality of measurement operations are carried out for different phase angles of the two modulation oscillations of the photoelastic modulators and a spatially resolved Stokes vector is determined on the basis of the measurement results.

3.   The method as claimed in claim 2, wherein at least four measurement operations are carried out for the phase angle pairs (α, β), $(\alpha, \beta + 90°)$, $(\alpha + 90°, b)$ and $(\alpha + 90°, \beta + 90°)$ of the phase

angles of the two modulation oscillations of the photoelastic modulators, where α and β designate predeterminable phase angles.

4. The method as claimed in claim 3, wherein the phase angles α and β are both predetermined as 0°.

5. The method as claimed in claim 2, wherein the difference between the oscillation frequencies of the two photoelastic modulators is chosen to be in the range of between 0.1 kHz and 10 kHz.

6. The method as claimed in claim 5, wherein the oscillation frequency difference is chosen to be in the region of around 1 kHz.

7. The method as claimed in one of claims 1 to 6, wherein an imaging beam pencil of a sample system introduced into the beam path of the beam pencil is examined.

8. The method as claimed in claim 7, wherein the sample system is a projection objective of a microlithography projection exposure apparatus.

9. The method as claimed in claim 8, wherein the examination of the imaging beam pencil furthermore comprises an interferometric wavefront measurement of the projection objective.

10. The method as claimed in claim 7, wherein the two photoelastic modulators are positioned at essentially the same distance (a) from a convergence point (7) of the beam pencil.

11. An apparatus for the spatially resolved polarimetric examination of an imaging beam pencil (1), having

- a pulsed radiation source (9) for generating the beam pencil,
- a first photoelastic modulator (6a), a second photoelastic modulator (6b) and a polarization element (5), which can be positioned serially in the beam path of the beam pencil,
- a control unit (8) for the control of the photoelastic modulators (6a, 6b) and for the driving of the pulsed radiation source in a manner correlated therewith, and
- a detector (4) for the spatially resolved detection of the beam pencil coming from the polarization element.

12. The apparatus as claimed in claim 11, wherein an evaluation unit (10) is provided, which determines a spatially resolved Stokes vector on the basis of the detection information from the detector (4).

13. The apparatus as claimed in claim 11, wherein it is set up for the spatially resolved polarimetric examination of an imaging beam pencil of a sample system.

14. The apparatus as claimed in claim 13, wherein the sample system is an optical imaging system and the examination comprises a pupil-resolved interferometric wavefront measurement of the optical imaging system.

15. The apparatus as claimed in claim 14, wherein the sample system is a microlithography projection objective.